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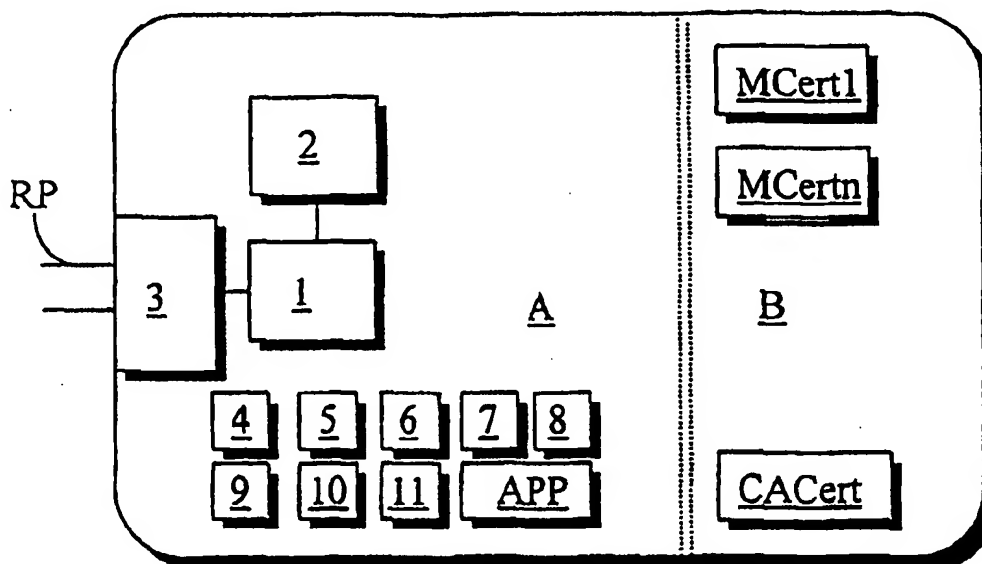Equivalents: AU3970200, EP1175799 (WO0064205), FI108389B, FI990846

ABSTRACT:

The invention concerns a method for the management of certificates stored on an identity
module. In the method, a certificate is received to the identity module, and information obtained
from said certificate is stored on the identity module. The invention makes it possible to increase
the number of certificates that can be stored on the identity module.

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(54) Title: MANAGEMENT OF AN IDENTITY MODULE

(57) Abstract

    The invention concerns a method for the management of certificates stored on an identity module. In the method, a certificate is received to the identity module, and information obtained from said certificate is stored on the identity module. The invention makes it possible to increase the number of certificates that can be stored on the identity module.

MANAGEMENT OF AN IDENTITY MODULE

FIELD OF THE INVENTION

The present invention relates to telecommuni-
cation systems and devices. In particular, the inven-
tion relates to a method for the management of an
identity module and to an identity module which com-
prises means for the management of its storage areas.

The invention concerns a method for the man-
agement of certificates stored in an identity module.
In the method, a certificate is received into the
identity module, and information obtained from said
certificate is stored on the identity module.

BACKGROUND OF THE INVENTION

Mobile communication networks, e.g. GSM net-
works (GSM, Global System for Mobile communications)
have become very popular in recent times. Supplemen-
tary services associated with mobile communication
networks are correspondingly increasing at an ever
faster pace, in widely varying fields of application.
The mobile telephone can be used, among other things,
as a means of paying for small purchases e.g. in auto-
matic vending machines for refreshment drinks and in
automatic car wash systems. Everyday functions, such
as payment functions, have been and will be added to
the services available via mobile stations. Next-
generation mobile stations will be considerably more
advanced than their predecessors in respect of service
level and data transmission capacity.

At present, a known practice is to use a
digital GSM mobile station or other electronic and
wireless terminal device having a unique identity for
commercial transactions, such as paying a bill or re-
mitting a payment by an electronic method. Patent
specification US 5,221,838 presents a device which can

be used for remitting a payment. The specification describes an electronic payment system in which a terminal device capable of wireless and/or wired data transfer is used as a payment terminal. The terminal
5 device according to the specification comprises a card reader, a keypad and a bar code reader for data input and a display for visual presentation of payment information.

Patent specification WO 94/11849 presents a
10 method for the utilization of telecommunication services and execution of payment transactions via a mobile communication system. The specification describes a system comprising a terminal device which communicates over a telecommunication network with a service
15 provider's mainframe computer containing the service provider's payment system. The terminal device, i.e. mobile station used in the mobile communication network, can be provided with a subscriber identification unit which contains subscriber data for subscriber
20 identification and encryption of telecommunication. The data can be read into the terminal device for use in mobile stations. As an example the specification mentions the GSM system, in which a subscriber identity module (SIM) or a SIM card is used as a subscriber identification unit.
25 scriber identification unit.

In a system described in specification WO 94/11849, a mobile station communicates with a base station in a mobile telephone network. According to the specification, a connection is further established
30 from the base station to a payment system and the amount to be paid as well as the data needed for subscriber identification are transmitted to the payment system. In a bank service as described in the specification, the client inserts a bank service card containing a SIM unit into a terminal device of a GSM
35 taining a SIM unit into a terminal device of a GSM network. In the telephone based bank service, the terminal device may be a standard GSM mobile station. By

the method described in the specification, a wireless telecommunication link can be used for implementing bank or cash services, such as remittance of payments and/or payment of bills or the like. It would also be

5 possible to use some other terminal device as a payment terminal. An important point is that the terminal device contains or can be provided with an identity module having its own unique identity. It may also be a separate fail-safe circuit or equivalent.

10   A digital signature, which is considered a general requirement in electronic payment systems, is used for the verification of the integrity of the material transmitted and the origin of the sender. A digital signature is generated by encrypting a hash

15 code computed from the material to be transmitted, using the senders secret key. As nobody else knows the sender's secret key, the receiver decrypting the material by using the sender's public key is able to ascertain that the material is unchanged and that it has

20 been generated by the sender using his secret key known to himself. An example of an algorithm used for generating a digital signature is the RSA encryption algorithm, which is a public-and-secret-key encryption system and which is also used for the encryption of

25 messages.

       To make it possible to use uniform procedures for reliable identification of the parties to a transaction or other agreement via a telecommunication network, it is necessary to have an electronic identity

30 and means for proving and ascertaining the identity. An electronic identity like this may also be e.g. a so-called network identity (Net-ID). An electronic identity is based on personal data stored on a smart card, subscriber identity module, electronic fail-safe

35 circuit or equivalent and the use of a key pair, a secret key and a public key, stored in a certificates directory maintained by a trusted third party. Using

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such a technique, it is possible to implement, among other things, the identification of parties, electronic signature, encryption and indisputability of transactions, in a manner providing a security level
5   sufficient for the authorities and other service providers.

In the present application, 'identity' refers to individualizing information which is attached to a person or a juridical person holding an identity and
10   which can be used to identify the person or holder. Likewise, 'identity' may refer to individualizing information pertaining to an application or service and allowing the application or service to be identified.

In a public key method, the user keeps a se-
15   cret key in private use only while a public key is publicly available. Storing the public key as such in a public directory, e.g. in a x.500 or LDAP directory, is not enough because someone might forge it and then act in the name of the rightful owner of the key. In-
20   stead, it is necessary to have a certification service and a certificate, which means an evidence given by a trusted third party (certifier) vouching that the name, the personal identifier and the public key belong to the same person. The certificate is generally
25   a data aggregate consisting of the person's public key, name, personal identification number and other information, and it is signed by the certifier using his own secret key.

When the receiver of a message provided with
30   an electronic signature wants to ascertain whether the message is an authentic one, he must first get the sender's certificate, from which he will learn the sender's public key and name. After this, he must verify the authenticity of the certificate. To this end,
35   he may have to obtain additional certificates (certification chain) which have been used to certify the certificate in question.

If the certificate is authentic, the receiver
verifies the signature of the message by using the
public key received in the sender's certificate. If
the signature passes this test, then the sender is the

5   person indicated by the certificate. The use of cer-
tificates also necessitates the use of a freeze file
in which discarded certificates are listed. For the
certificates and the freeze file, directory services
are needed.

10   When different applications used for elec-
tronic payment, commercial transactions, banking etc.
are stored on the identity module, the public keys
used in the services provided by service providers,
such as stores, banks and other organizations provid-

15 ing electronic services, used by these applications
are stored at the same time. Public keys can also be
stored later depending on the services used by the
user of the subscriber identity module. Thus, the user
of the identity module need not obtain a certificate

20 for each transaction separately as the certificate is
already on the identity module.

        The longer the certification chain created to
produce a certificate, the more information is needed
for the verification of the certificate. Certificates

25 requiring a large amount of memory are a problem to
current identity modules because the identity module
often has a limited memory space. This is a signifi-
cant factor limiting the use of the identity module
for different services having different certificates.

30 Therefore, it is an urgent objective to reduce the
size of the certificate to allow a larger number of
certificates to be stored on a single identity module.
A given service application may use several certifi-
cates when communicating on the user's behalf with the

35 services of different service providers. Thus, the
number of different services usable via the identity

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module is almost exclusively limited by the size of
the certificates.

OBJECT OF THE INVENTION

5   The object of the present invention is to
eliminate the problems referred to above or at least
to significantly alleviate them. A specific object of
the invention is to disclose a method and an identity
module that will make it possible to define the size

10   of a certificate or at least to reduce it, thus allow-
ing the number of certificates stored on a single
identity module for use in a mobile communication en-
vironment to be increased.

          A further object of the invention is to dis-

15   close a method whereby a larger number of certificates
than before can be stored on the identity module with-
out breaking the reliability chain in a chain of cer-
tificates.

          As for the features characteristic of the in-

20   vention, reference is made to the appended claims.

BRIEF DESCRIPTION OF THE INVENTION

          The main principle of operation of the solu-
tion of the invention is to store the required cer-

25   tificates on the identity module so that the certifi-
cates comprised in a certification chain are removed
from them. The identity module may be a SIM (Sub-
scriber Identity Module), a WIM (Wireless Identity
Module), a security module or a corresponding separate

30   fail-safe circuit or a similar device or component
used to manifest identity. The identity module may be
a fixed or a detachable component and it must be man-
ageable by the owner of the identity. A certificate
received on the identity module may be saved if it can

35   be authenticated using a card certificate stored on
the identity module. After the certification chain has

been removed, the remaining public key and the associated identity are stored in a protected storage area to which no access is allowed for any other applications than the application used by the card certifi-

5   cate. Every time when a service application in the identity module wants to use a certificate stored on the card, it requests it from the application used by the card certificate from the protected storage area. The application used by the card certificate verifies

10   the certificate read from the protected storage area and when the user trusts the issuer of the card certificate, the user can also trust the certificate read from the card.

The basic idea of the invention can be ex-

15   pressed in a nutshell as follows. A functional unit has been divided into two sections A and B and a condition C. The functional unit may be the storage device or memory of the identity module and the condition C may be a filter or algorithm controlling the

20   storage space. The function of section A is a known, open memory area and its functionalities can be influenced by known instructions, the operating system of the identity module. Section B may function in the same way as A, but the functionalities of B may only

25   be used by a party who knows the conditions C. In the present case, the condition C is only known to the certification authority D issuing the card certificate and to the filter or algorithm on the card which controls the protected storage area.

30   When a new certificate is to be stored on the identity module, the deliverer of the new certificate asks a certification authority D to store the certificate on the identity module. Certification authority D authenticates the new certificate received from an-

35   other certification authority E and selects from the certificate only those components F which necessarily have to be stored on the identity module.

Certification authority D generates his own
certificate G from the new certificate given by E and
from the selected components F. Appropriate informa-
tion about certificate G needed to make it possible to
5   read from which certificate the material F has been
generated and to establish that the material has been
certified by certification authority D is filed in the
directory.

Since only certification authority D knows
10   the conditions regarding the manner in which F is to
be disposed in the protected area B, F can be regarded
as a certificate that is not public and that can be
trusted.

In the method of the invention for the man-
15   agement of certificates stored on the identity module,
the certificate is received to the identity module and
information about said certificate is stored on said
identity module. The identity module comprises a stor-
age device of a data processing apparatus, said stor-
20   age device being connected to said data processing ap-
paratus, a card certificate stored on the storage de-
vice, an application which uses the certificates
stored on the identity module, and a data transfer de-
vice connected to said data processing apparatus and
25   provided with a communication interface for the trans-
fer of data between an external device, such as a mo-
bile station, and the identity module.

According to the invention, the authenticity
of said certificate is verified by means of said card
30   certificate before the certificate is stored, and the
certification chain contained in said authenticated
certificate is filtered out from it. Before the fil-
tering, each signature and certificate comprised in
the certification chain can be additionally verified
35   separately if necessary. After the filtering, the por-
tion of the certificate remaining to be stored com-
prises the public key contained in it and the identity

associated with it, but other information may be stored as well. In this way, the amount of storage space occupied by the certificate can be significantly reduced. When the certificate is to be used, it must

5   first be verified by means of the card certificate.

In an embodiment of the invention, the certificate is rejected if a verification carried out before its storage or use indicates that the certificate is unreliable. In addition, when reliable means and

10 software are used, the certificates and the transactions implemented using them can be trusted. However, we wish to point out here that, if the card certificate is rejected, this does not necessarily mean that the certificate could not be used by an application on

15 the card. Thus, if any one of the applications identifies the certificate, then it can be stored on the identity module. The only difference to the filtered certificate is that the certificate is stored in its complete form without filtering out anything from it.

20 The identity module of the invention for the management   of   certificates   comprises   the   above-mentioned components. Moreover, the identity module comprises means for receiving a certificate to the identity module and means for saving information con

25 tained in said certificate to a storage device.

According to the invention, the identity module comprises means for verifying the authenticity of the certificate by means of said card certificate before the storage of the certificate and means for fil

30 tering out a certification chain contained in the authenticated certificate from the certificate. Furthermore, the identity module comprises means for verifying the certificate by means of the card certificate before its use.

35 In an embodiment of the invention, the identity module further comprises means for rejecting the certificate if a verification carried out before its

storage indicates that it is unreliable, and means for rejecting the certificate if a verification carried out before its use indicates that it is unreliable. Moreover, the identity module may comprise means for
5   verifying the authenticity of each signature contained in said certificate before the filtering.

As compared with prior art, the present invention has the advantage that a larger number of certificates than before can be accommodated in a limited
10   storage space. In particular, the invention allows a larger number of certificates to be stored on the identity module or on a smart card.

A further advantage of the invention as compared with prior art is that an update of the identity
15   module with new certificates and applications can be certified by the certification method of the invention using a card certificate.

LIST OF ILLUSTRATIONS

20   In the following, the invention will be described by the aid of a few examples of its embodiments with reference to the attached drawing, wherein:

Fig. 1 is a diagrammatic representation of an identity module according to the present invention,
25   Fig. 2 is a diagrammatic representation of a method according to the present invention for storing a certificate on an identity module, and

Fig. 3 is a diagrammatic representation of a message structure which can be used in the method of
30   the present invention.

Although the invention is described in the following examples by referring to a subscriber identity module, it can be applied in conjunction with any terminal device that uses identity modules as men-
35   tioned above. The invention is not limited to GSM network subscriber identity modules.

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The subscriber identity module (SIM) pre-
sented in Fig. 1 comprises a data processing device 1,
such as processor, microcontroller or equivalent, a
storage device 2 connected to the data processing de-
5   vice 1 and a data transfer device 3 connected to the
data processing device 1. Moreover, the subscriber
identity module SIM is provided with a communication
interface IF for data transfer between an external de-
vice, such as a GSM mobile station, and the subscriber
10   identity module.

In addition, the subscriber identity module
presented in Fig. 1 comprises an application APP or
contains an application APP stored on it, which appli-
cation uses certificates stored on the subscriber
15   identity module when communicating with services pro-
vided by a service provider. Furthermore, the sub-
scriber identity module is provided with means 4 for
receiving certificates and means 5 for saving informa-
tion obtained from the certificate to the storage de-
20   vice 2. Moreover, the subscriber identity module com-
prises means 6 for establishing the authenticity of a
received certificate by using a card certificate
(CACert) as mentioned above and means 7 for filtering
out from an authenticated certificate a certification
25   chain contained in it before the storage of the cer-
tificate.

Further, the subscriber identity module pre-
sented in Fig. 1 comprises means 8 for authenticating
a certificate Mcert_1 stored on the subscriber iden-
30   tity module by means of a card certificate CA_Cert be-
fore its use. In addition, the subscriber identity
module comprises means 9 for rejecting a certificate
if a verification carried out before storage indicates
that the certificate is unreliable, and means 10 for
35   rejecting a certificate if a verification carried out
before use indicates that the certificate is unreli-
able. Furthermore, the subscriber identity module com-

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prises means 11 for authenticating the signature con-
tained in each of said certificates before the filter-
ing out of the signature.

In addition, referring to the above example,
5   Fig. 1 shows areas A and B, which, as mentioned above,
are a non-protected storage area A and a protected
storage area B. In the protected storage area is
stored at least the card certificate Card_CA, which
comprises the card certificate issuer's electronic or
10   network identity, a short name description of the cer-
tification authority, certificate type, e.g. RSA, a
public encryption key, a public signing key, certifi-
cate status, i.e. data indicating whether the certifi-
cate is active or passive, and the number of the short
15   message service center, said number referring to the
issuer of the certificate. Stored in the protected
storage area is also the user's own certificate,
which, by way of example, may comprise the same data
items as described above in conjunction with the card
20   certificate except that the public encryption key and
public signing key are replaced with a secret encryp-
tion key and a secret signing key, respectively. The
user's certificate is referred to in this example by
the term MCert_1. In addition, service providers' cer-
25   tificates, from which the certifying signatures have
been removed to reduce the storage space occupied by
them, may be stored in the protected storage area B.
These certificates are referred to by the designation
MCert_n. These certificates, too, preferably contain
30   the same data items as the card certificate.

Next, referring to Fig. 2, a preferred proce-
dure used for receiving a certificate to the sub-
scriber identity module will be described. First, the
certificate is received to the subscriber identity
35   module, block 20. The certificate has been authenti-
cated by the issuer of the card certificate, and this
is verified in block 21. If it is found that the

authenticity of the received certificate cannot be es-
tablished even with the card certificate Card_CA
stored on a card, then the certificate is rejected.
The procedure could alternatively be terminated at
5   this point, but in this example we can assume that re-
transmission of the certificate is requested, block
25, whereupon the certificate is verified again. This
may be repeated e.g. three times, and if even the
third attempt fails to prove the certificate to be
10 authentic, then the procedure is terminated.

If it was established in block 21 that the
certificate is authentic, then the entire certifica-
tion chain is filtered out from the certificate, leav-
ing only the public key and the associated identity
15 and possibly some additional data, block 23. After
this, the filtered certificate is saved, block 24, to
the protected filtered storage area B in the sub-
scriber identity module.

Next, referring to Fig. 3, a few preferred
20 message structures will be described which can be used
for the transmission of certificates according to the
invention via an air interface to the subscriber iden-
tity module. In this example it is assumed that the
message type used is short message (Short Message
25 Service, SMS), but, as is obvious to the skilled per-
son, other message types could be used as well. In
this example, the certificate is transmitted using
three short messages containing information as pre-
sented in Fig. 3.

30 The first message to be sent is a non-
encrypted SMS message #1 comprising two fields. Pub-
licKeyMod is a public verification or encryption key.
In addition, the message contains the sequence number
of the message, MsgNumber. The total length of this
35 message is 1033 bits, of which the public key takes up
1025 bits and the message number 8 bits. The second
message, Downloaded Data in message #2, comprises five

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fields. S3HDT describes the message type, ReceiverID the identity of the receiver, SenderID the identity of the sender, where the identity may be e.g. a network identity code, S3AP is a pointer referring to an ap-

5   plication which uses the certificate in question, and in addition the message comprises an RSA block, ENCDATA, which by default consists of signed and encrypted data. The size of this message is 1120 bits.

The signed and encrypted data, ENCDATA, in

10   the message comprises five fields, the first one of which contains the most significant bit RSA_MSB of the RSA, a start field Start, the root Random of a random number, transmitted data SP_data and a hash code Hash generated from the contents of the SP_data field. The

15   hash code is used to verify the integrity of the information and to ensure that the information has not changed during the transmission.

Further, SP_data in message #2 comprises eight fields, of which the first one, NID, refers to

20   the identity of the card certificate, ShortName refers to the name of the key holder, KeyUsage to the intended use of the key, KeyHash to a hash code generated from message number 1, MCertHash to a hash code generated from the certificate, and a message number,

25   MSG Number. Finally, a third message is sent, which further is part of the SP_data field of message 2 ENCDATA, this field further containing a pointer to the key pair NID of the issuer of the card certificate, the exponent PublicKeyE of the public key and

30   the sequence number MsgNumber of the message. We wish to point out further that the above description of message structures is not to be taken as a limitation but rather as an example of the application of the invention. In the verification of the authenticity of a

35   certificate received to the subscriber identity module, the above-described hash codes are used. By means of these, it is possible to make sure that the re-

ceived certificate has been signed and authenticated by a given predetermined certification authority or certificate issuer. After it has been established that the certificate is authentic, the public key and the associated identity can be picked out or filtered from it and stored in the filtered area B.

The invention is not restricted to the examples of its embodiments described above; instead, many variations are possible within the sphere of protection defined in the claims.

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CLAIMS

1. Method for the management of certificates stored on an identity module, said identity module comprising:

5   - a data processing device (1),

- a storage device (2) connected to said data processing device (1)

- a card certificate (CA) stored on the storage device,

10   - an application (APP) which uses the certificates stored on the identity module, and

- a data transfer device (3), which is connected to said data processing device (1) and which is provided with a communication interface (IF) for the

15   transfer of information between an external device and the identity module, said method comprising the steps of:

- receiving a certificate to the identity module, and

20   - storing information obtained from said certificate on said storage device, c h a r a c t e r i z e d in that the method further comprises the step of:

- authenticating said certificate by means of said card certificate before storage of the certificate.

25   2. Method according to claim 1, c h a r a c - t e r i z e d in that said authenticated certificate is filtered to remove from it a certification chain contained in it.

3. Method according to claim 1 or 2, c h a r -

30   a c t e r i z e d in that said certificate is authenticated by means of the card certificate before its use.

4. Method according to claim 1, c h a r a c - t e r i z e d in that, of the information contained in said certificate, the public key and the associated

35   identity are stored.

5. Method according to claim 1, c h a r a c - t e r i z e d in that said certificate is rejected if a

verification carried out before its storage indicates that it is unreliable.

6. Method according to claim 1, c h a r a c -
t e r i z e d in that said certificate is rejected if a
5 verification carried out before its use indicates that it is unreliable.

7. Method according to claim 1, c h a r a c -
t e r i z e d in that during the filtering:

each signature comprised in said certificate is
10 verified,

and only signatures that the verification proves to be authentic are filtered out from said certificate.

8. Identity module for the management of cer-
15 tificates, said identity module comprising:

- a data processing device (1),

- a storage device (2) connected to said data processing device (1)

- a card certificate (CA) stored on the storage
20 device,

- an application (APP) which uses certificates,

- a data transfer device (3), which is connected to said data processing device (1) and which is pro-vided with a communication interface (IF) for the
25 transfer of information between an external device and the identity module, said system comprising:

- means (4) for receiving a certificate to the identity module, and

- means (5) for storing information contained in
30 said certificate on said storage device, c h a r a c -
t e r i z e d   in that the subscriber identity module further comprises:

- means (6) authenticating said certificate by means of said card certificate before storage of the
35 certificate.

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9. Identity module according to claim 8, c h a r a c t e r i z e d in that the identity module further comprises

means (8) for filtering out from the certificate a
5   certification chain contained in said authenticated certificate.

10. Identity module according to claim 8, c h a r a c t e r i z e d in that the identity module further comprises means (8) for establishing the aut-
10 henticity of said certificate by means of a card certificate before its use.

11. Identity module according to claim 8, c h a r a c t e r i z e d in that the identity module further comprises means (9) for rejecting said certi-
15 ficate if a verification carried out before its storage indicates that it its unreliable.

12. Identity module according to claim 8, c h a r a c t e r i z e d in that the identity module further comprises means (10) for rejecting said certi-
20 ficate if a verification carried out before its use indicates that it its unreliable.

13. Identity module according to claim 8, c h a r a c t e r i z e d in that the identity module further comprises means (11) for verifying the authen-
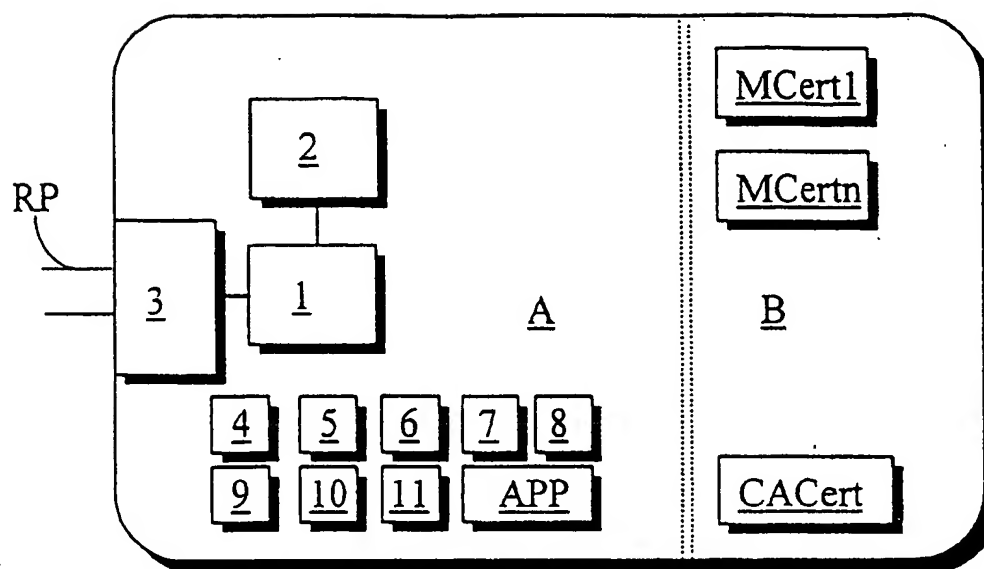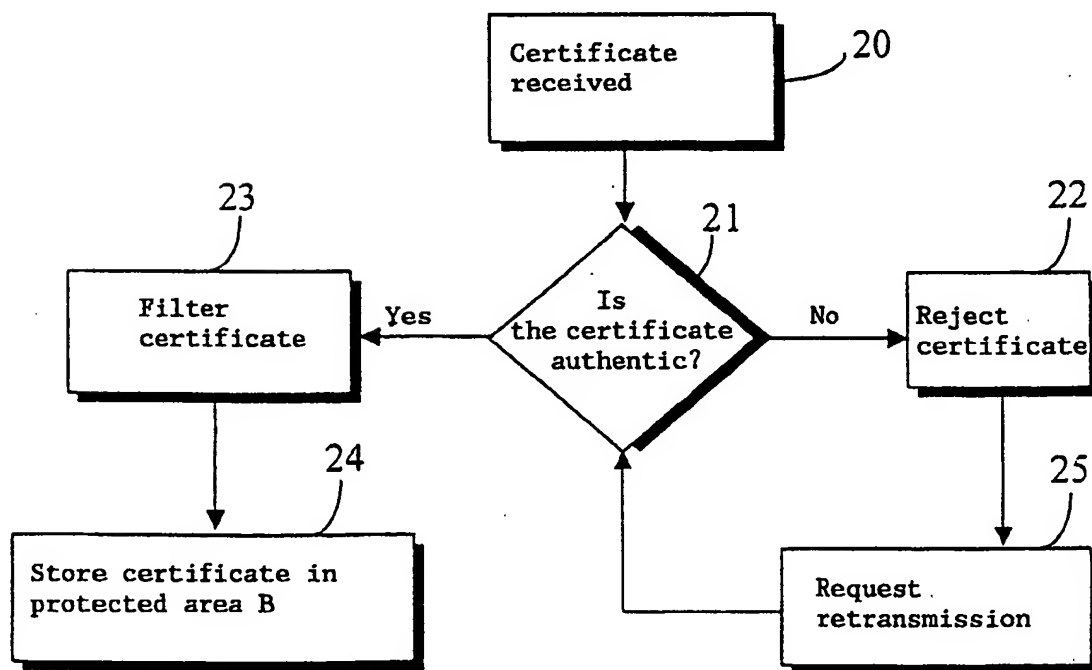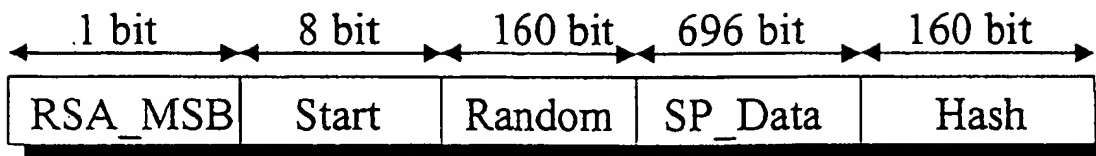25 ticity of each signature contained in said certificate before the filtering.
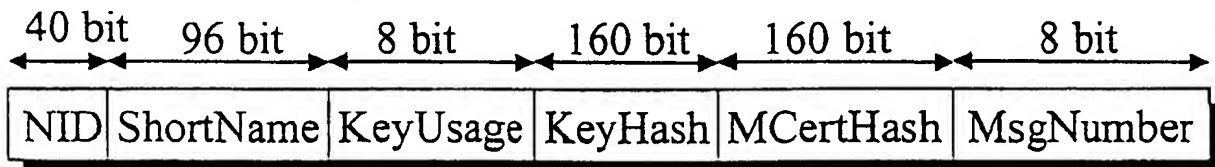
Fig. 1

Fig. 2

EncData in message#2 (1025 bit)

1 bit	8 bit	160 bit	696 bit	160 bit
RSA_MSB	Start	Random	SP_Data	Hash

SP_Data in message#2 (696 bit)

40 bit	96 bit	8 bit	160 bit	160 bit	8 bit
NID	ShortName	KeyUsage	KeyHash	MCertHash	MsgNumber

SP_Data in message#3 (548 bit)

40 bit	500 bit	8 bit
NID	PublicKeyE	MsgNumber

Non encrypted SMS-message#1

1025 bit		8 bit
PublicKeyMod		MsgNumber

Downloaded Data in message#2

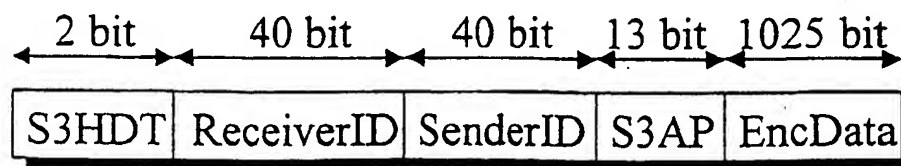| 2 bit	40 bit	40 bit	13 bit	1025 bit
S3HDT	ReceiverID	SenderID	S3AP	EncData
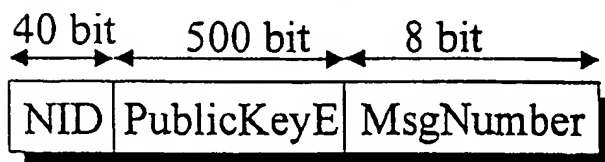
Fig. 3

INTERNATIONAL SEARCH REPORT

International application No.
PCT/FI 00/00328

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: H04Q 7/32, H04M 1/66, H04L 9/32, G07F 7/08

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: H04Q, H04M, H04L, G07F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5878144 A (DAVID W. AUCSMITH ET AL), 2 March 1999 (02.03.99), column 1, line 65 - column 2, line 26	1-13
A	EP 0869637 A2 (ARCANVS KAYSVILLE), 7 October 1998 (07.10.98), abstract	1-13
A	WO 9411849 A1 (VATANEN, HARRI, TAPANI), 26 May 1994 (26.05.94), page 3, line 10 - page 5, line 9	1-13
A	US 5835595 A (ALEXANDER GIBSON FRASER ET AL), 10 November 1998 (10.11.98), abstract	1-13

☐ Further documents are listed in the continuation of Box C.   ☒ See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
29 Sept 2000	0 4 -10- 2000
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Stefan Hansson/MP Telephone No. +46 8 782 25 00

Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT
Information on patent family members

01/08/00

International application No.

PCT/FI 00/00328

Patent document cited in search report			Publication date	Patent family member(s)			Publication date
US	5878144	A	02/03/99	AU EP US WO	3975097 1002392 5712914 9908418	A A A A	01/03/99 24/05/00 27/01/98 18/02/99
EP	0869637	A2	07/10/98	NONE			
WO	9411849	A1	26/05/94	AT DE EP SE ES FI FI GR NO RU	159602 69314804 0669031 0669031 2107689 925135 934995 3025393 951814 2116008	T D,T A,B T3 T A A T A C	15/11/97 12/02/98 30/08/95 01/12/97 12/05/94 12/05/94 27/02/98 09/05/95 20/07/98
US	5835595	A	10/11/98	CA EP JP	2212813 0828210 10207755	A A A	04/03/98 11/03/98 07/08/98